Studies on the Papaya Damping-off Disease

By

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Abstract

Among the varieties of papaya plants to damping-off indicated that the variety of "Line 1" Solo is the most susceptible to this disease, the percentage of its infestation reached about 26.6%. Some new varieties of papaya plants introduced were Costa Rica and A 4 (H.P.) which have been proven to be the most resistant to this disease. The percentage of its infestation ranged from 2.3 to 4.7% in these varieties.

Up to now, the "Solo 1" variety is widely cultivated in southern Taiwan. The damage of this variety frequently causes heavily injury under favorable conditions. The damping-off is rapadily developed in the seedling stage, particularly in raining season, because the weather frequently changes high humidity at fine days and the temperature is constantly very high. However, the disease is chiefly affected by rainy days and temperature.

The fungi were isolated from the diseased tissues of various papaya in the seedbeds and orchards, when five kinds of fungi have been found to be *Fusarium* spp., *Rhizopus* spp., *Rhizoctonia* sp., *Phytophthora* spp., and *Pythium* sp., among which the *Fusarium* spp., and the *Rhizoctonia* sp. are more important than other ones.

Introduction

Damping-off is an important disease of the papaya plants, it causes seriously damage to the papaya plants in the seed bed. Both pre-emergence and post-emergence damping-off may occur. In pre-emergence damping-off, the seed failed to germinate because it is invaded by the pathogen. In post-emergence damping-off, the newly emerged plants collapsed the stem tissues which was adjacent to a soil surface and stem wilt until the stem was entirely dry out and dead. Development of the disease is available for high temperature, high humidity, soil moisture, poor aeration, high levels of ferilzer of nitrogen application and closely sowed seeds (5).

The wet season in southern Taiwan begins from April to October throughout the year, during which the disease was more rampant in adapting itselves than that of other months.

A number of fungi including *Pythium aphanidermatum*, *P. ultimun*, *Phytophora parasitica* and *Rhizoctonia* sp. could cause the damping-off in regarding papaya seedlings which have been preported (1,2,3,4,5,6). These fungi exist into the soil for attacking the young seedlings. Results obtained from the study are presented in this paper.

Materials and Methods

The experiment was conducted at Departement of Plant Protection, Chia-yi Agricultu-

Grateful acknowledgement is expressed to Mr. C. H. Tao for reading the manuscript.

ral Experiment Station from April to October, 1969. All kinds of papaya seeds were separately sown in each seed box (42 x 29 x 10 cm), and then transplanted into the small pots when the seedings were about 10 cm in high. The soils were not sterized in each time, all pots were put in the yard after transplanting. The pots were dia. 13 cm, 10 cm high in size. One hundred pots were used for preparing to cultivate seedlings of papaya in each month this year, and the infested plants were calculated per month throughout the duration of the experiments.

Isolation of various fungi were made from the infested tissues which were sampled from different stages of seedbeds and orchards. These infested tissues were washed under running water for a few hours to remove the superficial organisms and disinfested in 0.1% Hgcl for 2-3 min, rinsed in sterile distilled water at least three times, then they were placed on agar in the petri dishes. Both potato sucrose agar and Czapek's agar were used.

Results

Susceptibility of papaya varieties: Fig 1 showed that "Line 1" Solo was most susceptible to the disease, the infestation of the disease was 26.6%. Costa Rica and A_4 (H.P.) seemed to be more resistant to the disease than other ones,but the A_4 (H.P.) was better than that of Costa Rica variety. However, the Fung-san Hybrid no. 1, Kr (N.P.), Fung-san no. 2 and A_5 (N.P.) were also susceptible to this desease. The damage of these varieties ranged from 15.8. to 20.5%, the Ky (N.P.) has been found to be the least resistance to this desease.

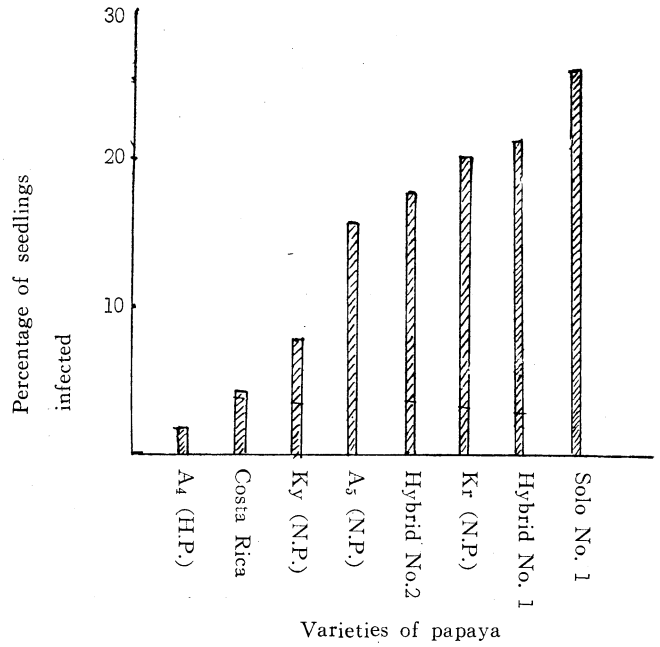

Fig. 1. An observation on different papaya varieties to damping-off disease

Effects of meteorogical factors for Solo 1 variety: Serious outbreaks of this desease are generally connected with climatic conditions, particulary in raining season. The rela

tive infestation of this desease are mainly factors both the high temperature and the high moisure of soil, when the pathogens rapidly multiply and are very activity into the soils resulting the stem wilt during the high temperature. But the variation of its infestation was dependent upon the temperature and soil moisture, as its infestation of percentage of seedlings reaches two peaks in June and in September, especially in significance of September, as shown in figure 2:

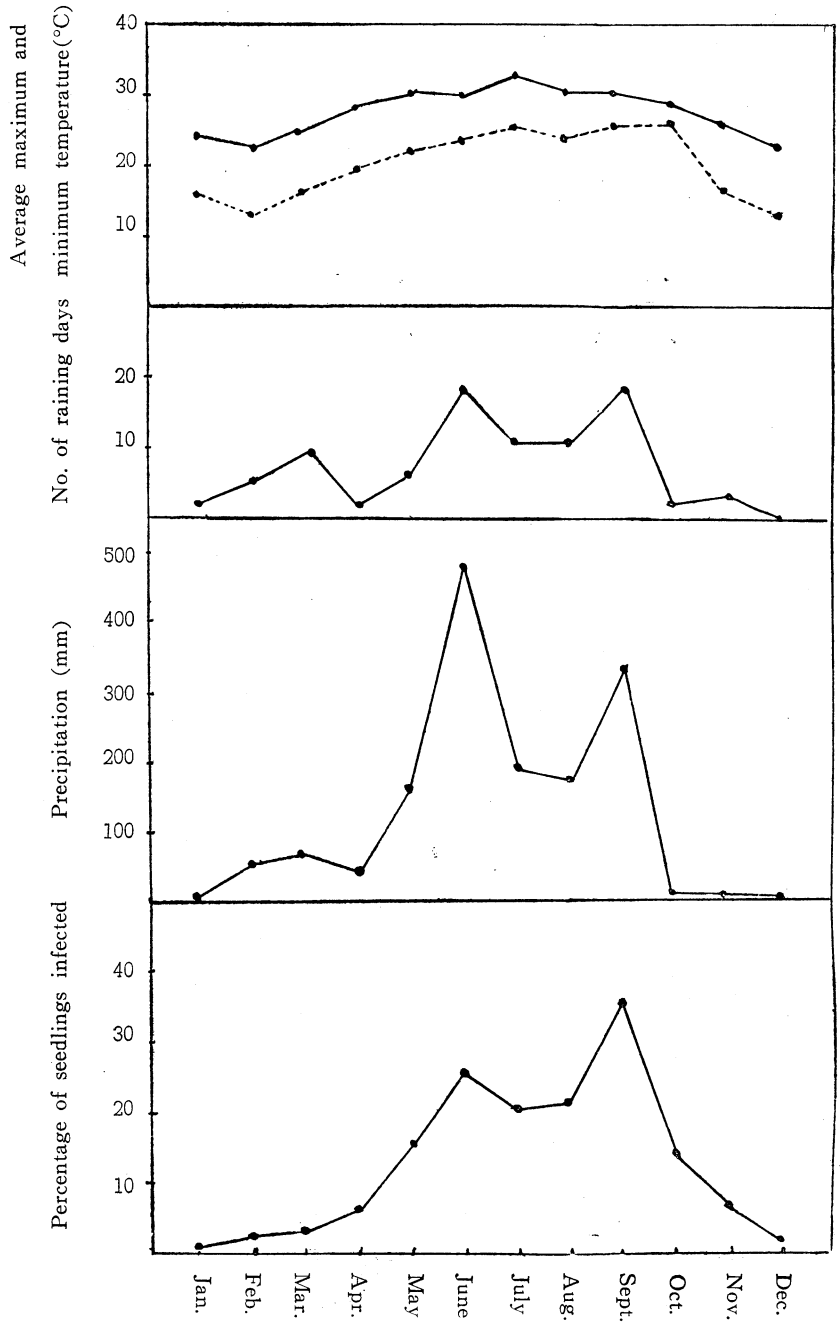

Fig. 2. Incidence of Damping-off in relation to climatic conditions

The fungi isolated from infested tissues: Samples of 187 isolates were found to be five kinds of fungi and some kinds of fungi (inidentified) in the isolations. According to the records, the relative frequencies of these in discussion may be arranged in the following descending order: *Fusarium* spp., *Rhizopus* spp., some fungi (inidentified), *Rhizoc tonia* sp., *Phytophthora* spp., and *Pythium* sp., of which *Rhizopus* sp. and *Fusarium* spp. have been found to be abundant in pre-emergence of this desease during the young seedling stage and *Rhizoctonia* sp. in old seedlings. However, *Phytophthora* spp. and *Pythium* sp. appeared were to be the least in the isolations, as shown in table 1:

Table 1. Fungi isloated from diseased tissues

Fungi isolated	No. of isolates (total)	Freque.ncies %
Fusarium spp.	77	41.2
Rhizopus spp.	42	22.5
Rhizoctonia sp.	36	19.3
Inidentified	20	10.7
Phytophthora spp.	7	3.7
Pythium sp.	5	2.7

Discussions and Conclusions

Damping-off is a serious disease of seed bed and young seedling stages of papaya in southern Taiwan during raining season. According to the results, "Line 1" Solo variety is more susceptible to this disease and its susceptibility was 26.6%. Some exotic varieties, such as A_4 (N.P.) and Costa Rica were considered to be more resistant to this disease, but Costa Rica was only less resistant to this disease than that of A_4 (N.P.). Their infestations ranged from 2.3 to 4.7 percent.

The disease was caused by soil pathogens which exist in the soil for attaking the young seedlings. It was suitable for its multiplication under microclimatic conditions such as wet weather and high temperature. The soil moisture is constantly high and causes heavy damage to the young seedlings durining raing season. The degree of its infestation was dependent upon meteorological factors regarding with temperatures, unmber of rainy days and precipitations particularly significant in June and September this year.

The soil fungi cause the damping-off in young seedlings and resulting the root rots in old stages. Isolation of the diseased tissues revealed that the *Fusarium* spp., was the most numerous among them, and then the *Rhizopus* spp. and *Rhizoctonia* sp. were only less than the above one, but the *Phytophthora* spp. and *Pythium* sp. were at lowest among them. Although the *Phytophthora parasitca, Phytopthora palmivora, pythium aphavidermatum* and *P. ultimun* have been reported (2,4,6), they were the causitive agents, but experim ental data have recently been collected that *Rhizoctonia* sp. is one of the causes of the pr-

oblem. The fungus of *Rhizopus* spp. usually covered the surface of the seeds and caused the seeds collapsed before emergencing. *Pythium ophanideratum* and *Phytophthora parasitica* play a significant role in the replant problem of papaya in Hawaii (2,4).

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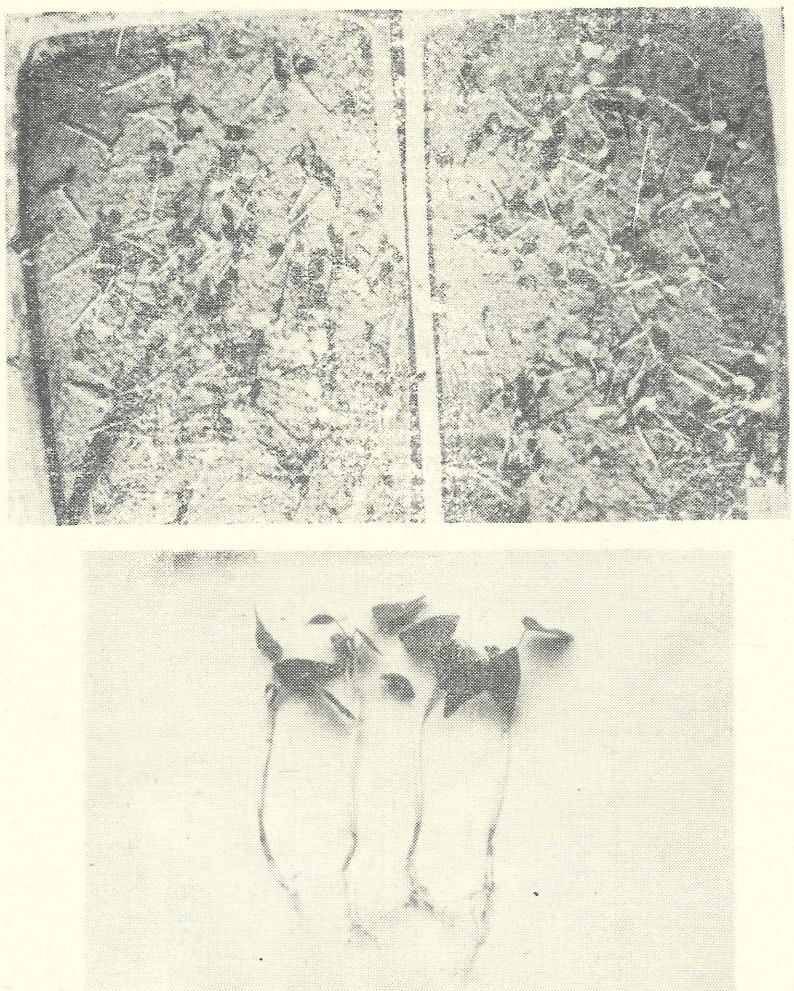

Fig. 3. A. Damping-off seedlings in the seed boxes
B. Damping-off seedlings(notice the stem tissues at the soil line)

木瓜腰折病之研究

蔡 武 雄[1]

在所觀察的木瓜品種中，以蘇魯 1號最易感病，其發病率達 26.6 % ，一些引進品種以 Costa Rica 及A_4 (H.P.)最抗病，其發病率爲2.3及4.7%。

目前蘇魯 1號爲臺灣南部栽培最廣的品種，但在高溫、高濕的雨季，常遭致腰折病爲害。由試驗結果得知，本病與高溫，下雨日數及雨量有密切關係。

從病組織分離所得的病原菌，以 *Fusarium* spp. 最多，其次爲 *Rhizopus* spp. 及 *Rhizoctonia* sp. *phytophthora* spp. 及 *pythium* sp. 最少，由另一試驗得知， *Rhizoctonia* sp. 爲木瓜腰折病一種重要的病原菌。

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1. 嘉義農業試驗分所技士